1990-1991 D.A.T.E. PROGRAM REPORT

Ministry of Agriculture, Fisheries and Food

Hon. Larry Chalmers, Minister

1990 - 1991
D.A.T.E. PROGRAM REPORT

Demonstration of Agricultural Technology
and Economics

Province of British Columbia Ministry of Agriculture, Fisheries and Food
Victoria, B.C.
1991

British Columbia Cataloguing in Publication Data

Main entry under title:
D.A.T.E. program report. -- 1974-1989 ; 1990/91-

Annual.
Subtitle varies.
Issuing body varies: 1974-1975, Dept. of Agriculture; 1976-1979, Ministry of Agriculture; 1980-1985, Ministry of Agriculture and Food; 1986-1989, Ministry of Agriculture and Fisheries; 1990/91- , Ministry of Agriculture, Fisheries and Food.
ISSN 0706-9308 = D.A.T.E. program report

1. D.A.T.E. Program - Periodicals. 2. Agriculture - Research - British Columbia - Periodicals. I. British Columbia. D.A.T.E. Committee. II. British Columbia. Dept. of Agriculture. III. British Columbia. Ministry of Agriculture. IV. British Columbia. Ministry of Agriculture and Food. V. British Columbia. Ministry of Agriculture and Fisheries. VI. British Columbia. Ministry of Agriculture, Fisheries and Food.

S542.C3D23 630.72'0711
Rev. June 1991

This publication was published by:
Extension Systems Branch
(604) 387-3498
B.C. Ministry of Agriculture, Fisheries and Food
808 Douglas Street
Victoria, B.C.
V8W 2Z7

7/91-300

93-01121/

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1990 - 91 D.A.T.E. Program

The D.A.T.E. (Demonstration of Agricultural Technology and Economics) program provides for British Columbia Ministry of Agriculture, Fisheries and Food staff supervised projects.

Nineteen new and ongoing projects were carried out and reported on during the 1990-91 fiscal year. Included below are highlights from a few of the areas studied:

- Hi-tech investigation into the identification of plant pathogenic bacteria was carried out using the Biolog program. Diagnosis of bacterial diseases is faster and more specific than before which means that growers can start control measures earlier and can use the most effective disease management techniques for the particular bacterial species.

- A project was carried out to demonstrate the effectiveness of a pheromone-based mating disruption treatment for control of codling moth in organic apple and pear orchards in the Okanagan and Similkameen Valleys. It was shown that the pheromone-based treatment can be effective in controlling codling moth damage when used in conjunction with sound orchard management.

- A survey of British Columbia dairy herds was carried out to determine the incidence and economic significance salmonella. The survey revealed that the quality of milk produced in British Columbia with respect to salmonella is very good and well above other jurisdictions in North America.

- A project was carried out to evaluate the effectiveness of drainage water recovery and recirculation in greenhouse vegetable operations. It was shown that a recovery and recirculation program can be effective in reducing ground water pollution. New recirculating technologies can significantly reduce the amounts of fertilizer and other effluent draining from the greenhouses.

- B.C. grown food was effectively promoted at two Vancouver Island fairs in the "Great Taste of the Comox and Cowichan Valley" display and demonstration booths.

The D.A.T.E. Program Committee would like to acknowledge the cooperation of the project supervisors in implementing the 1990-91 D.A.T.E. Program. Program results are very valuable to the agricultural industry.

INTENSIVE APPLE PLANTING DEMONSTRATION PROJECT

Intensive Apple Planting Orchard Tour

Project Number: 200

Supervision: Mike Sanders, Provincial Tree Fruit Specialist, Kelowna, B.C.
Dr. H. Quamme, Pomologist, Agriculture Canada, Summerland, B.C.
N. Filipenko, Naramata Cooperative, Naramata, B.C.

Cooperator: Ted Ritchie

Branches: Development and Extension, Southern Interior Region
Farm Management

Funding: D.A.T.E./New Crop Development/Ted Ritchie - approximately $20,000 each over 5 years

Objective: To demonstrate four apple training systems in a commercial orchard using McIntosh. The systems are U.S.D.A. Central Leader, Van Roechoudt Trellis, Central Axe and Slender Spindle. Rootstocks are M. 9 and M. 26. An annual economic analysis has been prepared showing costs and returns for each system.

Summary: The 1990/91 fiscal period is the final year of funding for this project. A complete detailed report will be prepared.

Production in this planting has been lower than anticipated due to planting poor quality trees and low vigor. The vigor problem was addressed in 1990 by fertigating with 10-34-0 and 32-0-0. The overall response was good.

To a certain extent, tree vigor has been affected by water flowing away from the drip sites on this sloped, heavy soil. This problem was greatly reduced by putting down sand and leaving weed trash.

Fruit quality was adequate to good except where vigor or shading was excessive.

The following summarizes production in pounds per acre to date:

	1988	1989	1990	Total
Slender spindle	0	5,600	11,200	16,800
Trellis	0	3,600	8,800	12,400
Central Axe	0	4,000	7,200	11,200
Central Leader	0	2,800	5,600	8,400

This has been a very useful trial. It has provided some necessary information and has been used as a demonstration site.

IMPROVED MARKETABILITY OF B.C. PRODUCED HORSES

Project Number: 267

Supervision: Mark Robbins, Horse Industry Development Specialist, Cloverdale

Cooperators: Horse Council of B.C., Horse Industry Division
Various Breed Representatives

Branch: Specialized Programs

Funding: D.A.T.E. 1988-89 - $15,000
D.A.T.E. 1989-90 - $10,000
D.A.T.E. 1990-91 - $10,000

Objectives: To assist the horse breeding industry over a three year period in developing a recognized horse evaluation program (the B.C. Horse Improvement Program).

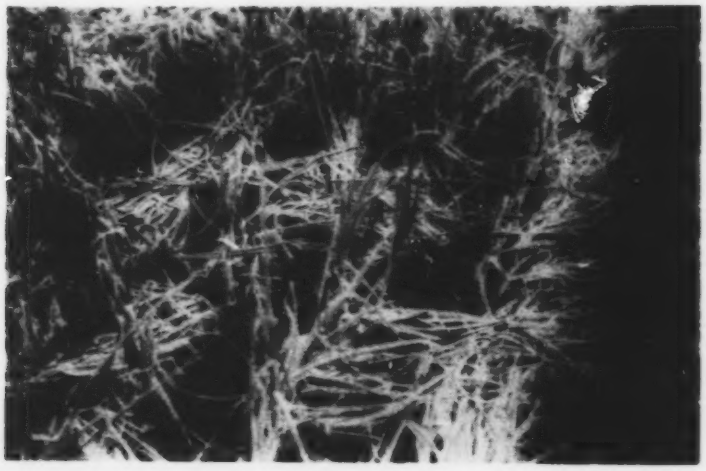
The program enables the industry to identify superior animals while enhancing the marketability of B.C. produced animals. The major criteria for selection of superior animals within each breed is form (conformation) as related to function (performance) with emphasis placed on the athletic ability of the horse.

Summary: The B.C. Horse Improvement Program was held at Milner Downs, Langley, B.C., October 6, 7 and 8, 1990. A total of 159 horses representing 18 breed divisions and 5 performance divisions were evaluated by a panel of three judges. A total of 21 of the coveted platinum seals (90 - 100%) were awarded in 11 breeds. Results from all the divisions were distributed and top ranking horses within each breed are being used to promote the breed, the horse and the breeder and owner in various equine publications.

Earlier in the year an evaluation of 22 Welsh ponies was held at the Pacific National Exhibition in preparation for a move of the Horse Improvement Program to regional fairs around the province in 1991.

At the conclusion of the D.A.T.E. funding, the Horse Improvement Program has met its goals of establishing a unique B.C. horse evaluation program. In 1991 the program will be expanded to more British Columbia horse breeders as it moves to fairs in different regions of the province: Interior Provincial Exhibition in the Okanagan, Saanich on Vancouver Island, and Matsqui in the Fraser Valley.

ONION LEAF BLIGHT PREDICTION SYSTEMS FOR ACCURATE TIMING OF FUNGICIDE APPLICATIONS



Cloverdale onion crop severely damaged by Leaf Blight

Project Number: 283

Supervision: Dave J. Ormrod, Plant Pathologist
Cloverdale

Project Staff: Karen Stroes, B.C. Coast Vegetable
Cooperative Association

Cooperators: W.J. Odermatt, P. Ag., Fresh Vegetable
Specialist, Cloverdale, B.C.
H.S. Snow, Fresh Vegetable Technician,
Cloverdale, B.C.
Cloverdale Produce Farms, Cloverdale, B.C.
Sprangers Farms, Cloverdale, B.C.

Branch: Crop Protection

Funding: D.A.T.E. 1989-90 - $4,000
D.A.T.E. 1990-91 - 4,000

B.C. Coast Vegetable Co-op
1989-90 - $4,210
1990-91 - 3,372

Objective:

The two million dollar Cloverdale bulb onion crop cannot be grown successfully without a spray program for control of the fungus diseases, leaf blight and downy mildew. At the present time, growers commence spraying according to the calendar. This can result in severe disease losses if spraying starts too late in a wet year. On the other hand, it may result in unnecessary and expensive fungicide applications in a year having low disease pressure. To determine if a more accurate method of timing fungicide sprays was possible for the Cloverdale area, three blight prediction systems were evaluated in 1989 and 1990.

Summary:

In 1989, the BOTCAST system developed in Ontario and the BLIGHT-ALERT and CDL/SSP (Critical Disease Level/Sequential Sampling Plan) systems developed in New York, failed to reduce the number of sprays compared to the calendar schedule. Furthermore, because the fungicides used were not effective against downy mildew, severe crop injury also occurred as a result of downy mildew favourable growing conditions.

In 1990, weather conditions were quite different. After the flooding of early June, when the onions were still very small, the remainder of the growing season was dry. This resulted in low disease pressure from both downy mildew and leaf blight. As a result, all three prediction systems gave blight control equal to the conventional spray schedule with fewer fungicide applications. Because the only effective registered blight control fungicide is very costly, savings of up to $300/ha were realized by using only two applications as recommended by BLIGHT-ALERT and CDL/SSP rather than five applications indicated by the calendar spray schedule.

The 1990 results were encouraging enough to warrant further investigation by private pest monitoring firms in 1991.

The key to successful commercial development lies with computerization of all data collection and analysis. This will require some software development to provide the final step in the program, namely the timely spray recommendation to the grower based on all the collected data.

EVALUATION OF HERBICIDES SINGLY OR IN COMBINATION FOR WEED CONTROL ON CONTAINERIZED ORNAMENTAL PLANTS

Project Number: 284

Supervision: Carol Barnett, Nursery Industry Specialist, Abbotsford, B.C.

Cooperators: Roy Cranston, Weed Specialist, Crop Protection Branch, Cloverdale, B.C.
Cannor Nurseries Ltd.
Homestead Nurseries Ltd.
W. Van Vloten Nurseries Ltd.
Kato's Nursery
Hybrid Nurseries Ltd.

Branch: Development and Extension, South Coastal Region

Funding: D.A.T.E. 1989-90 - $1,700

Objective: To assess the efficacy and phytotoxicity of a range of herbicides, of which most have current Canadian registration but not a minor use for containerized woody ornamentals. The following data was collected over two growing seasons:

a) level and duration of weed control,
b) phytotoxic symptoms on the ornamental plant,
c) prevalent weed species requiring control in containers

Summary: The trial site was located at the Agriculture and Food Centre, Abbotsford. Seven treatments which represent five herbicides used alone or in combination were applied to 7 plant types (July 19 or August 16, 1989). Ten treatments were applied in 1990 (April 4 or May 4). The plant types were spruce, mugo pine, potentilla, arborvitae, Blue Rug juniper, Prince of Whales juniper and Golden Phitzer juniper. All plants except control and the sethoxydim treatment were weeded prior to application or reapplication in 1990.

Efficacy ratings were recorded on November 20, 1989, and July 4, 1990. They are as follows (mean of 6 blocks):

#	Treatment	Rate (a.i.)ha	Weed Control* '89	'90
1	Chloramben 4G	4.5 kg	0.5	1.3
2	Chloramben 4G	6.5 kg	3.0	3.2
3	Trifluralin 5G	4.5 kg	4.8	1.7
4	Trifluralin 5G	7.0 kg	4.8	1.0
5	Diphenanid 50 WP	7.0 kg	4.4	1.5
6	Sethoxydim EC + Merge	0.35 kg + 1.0%		0
7	Trifluralin 5G + Napropamide 10G	4.5 kg + 4.5 kg	5.3	4.5
8	Simazine 90 WDG + Napropamide 10G	1.0 kg + 4.5 kg		6.9
9	Rout (Goal + Surflan G)	3.3 kg		6.7
10	Trifluralin EC + Napropamide WP	6.0 kg + 6.0 kg	9.0**	4.8
	Treated bark mulch			
	Check		0	0

* Rating 0 = no weed control to 9 = complete weed control with 7 and up being commercially acceptable. (Expert Committee on Weeds Scale)

** Treated bark mulch gave excellent weed control. However, phytotoxicity was evident on all species but spruce in 1989. This treatment was not reapplied in 1990. Prevalent weed types were noted as a major infestation of bittercress, with minor infestations of groundsel, fireweed, small-flowered fireweed and dandelion in the first season. Major infestations of bittercress, groundsel and small-flowered fireweed were noted in the second season.

Other broadleaf, grass and moss weed types were noted but were not prevalent throughout the trial area.

Overview of 1990 Season

	Treatment # 1	2	3	4	5	6	7	8	9	10
Bittercress	no	no	no	S	no	no	no	no*	S*	no
Groundsel	no	no	no	no	S	no	S*	S	S*	no
Small-flowered fireweed	no	S	no	no	no	no	no	S	no	no

Notes: no = no control in 4 or more reps
S = slight control, weeds in less than 4 reps
* = commercially acceptable even though one or more weeds were present

General Comments:

1) The two commercially acceptable treatments were #8 - Princep Nine-T (simazine 90%) plus Devrinol (napropamide 10%) and #9 - Rout (Goal + Surflan 3% not registered in Canada).

2) The media soak treatment #10 (5 upper cm of medium soaked in herbicide before potting) stunted the plants, but did not kill them. The root system did not penetrate this area during the first year. Excellent weed control continued through the first season, but diminished (no repeat application) in the second season.

3) Treatment #6, a post-emergence application of Poast seemed to augment the germination and growth of small-flowered fireweed.

4) The juniper and hedging cedar plants were smaller than the check in one replication for treatments #3 - 6, probably due to weed competition. Treatment #1 suppressed growth in 2 reps and treatment #2 suppressed growth in 3 reps suggesting the chance of a phytotoxic effect with chloramben (now removed from market).

Results of the trial will be documented in the Expert Committee on Weeds (Western) Research Appraisal and Planning Report.

PHEROMONE-BASED MATING DISRUPTION FOR CONTROL OF CODLING MOTH

Can you find the Pheromone Dispenser Hanging in the Pear Tree

Project Number:	292
Supervision:	Hugh Philip, Entomologist Kelowna, B.C.
Project Staff:	Lynne Brochu, Robert Dickison and Sara Critchley
Cooperators:	Dr. Gary Judd and Don Thomson, Entomologists Agriculture Canada Research Station Summerland, B.C.
Branch:	Crop Protection
Funding:	D.A.T.E. 1990-91 - $6,500 S.O.O.P.A. - 5,000 Agriculture Canada - 2,500
Objective:	To evaluate and demonstrate the effectiveness of a pheromone-based mating disruption treatment for control of codling moth in organic apple and pear orchards in the Okanagan and Similkameen Valleys.

Summary: Codling moth is the most important insect pest of pome fruits in the interior of British Columbia and a major constraint to successful production of organic apples and pears. Female codling moths release sex pheromones to attract male mates. Synthetic pheromones have long been used in traps to monitor seasonal flight activity and to time insecticidal sprays against codling moth. However, research over the past three years has shown that pheromones can be used to control codling moth. When synthetic pheromones are released into the air in large enough quantities, male codling moths are unable to find females, hence normal mating is disrupted, fewer viable eggs are laid, and less crop damage ensues. This study was undertaken to demonstrate the efficacy of mating disruption as an alternative to using insecticides in commercial orchards in the interior of British Columbia.

In 1990, four apple and three pear blocks were treated with pheromone, two apple and three pear blocks were treated with insecticides and one apple block was left untreated. Each orchard was monitored with pheromone traps throughout the season to assess male disorientation to traps (considered to be one measure that disruption is occurring). Each orchard was sampled for codling moth damage at harvest. All trees in each of the four pheromone-treated apple orchards were banded with 10 cm cardboard strips to capture overwintering larvae that cocoon in such sites. Banding data will provide an estimate of the codling moth population size going into next season and will allow assessment of the efficacy of disruption as tool in population suppression when densities are known.

Results from this year have shown that pheromone-based mating disruption used in conjunction with sound orchard management can effectively control codling moth damage as well or better than insecticides. Damage levels in four pheromone-treated apple blocks (0.75, 0.55, 0.21 and 0.78%) were not significantly different from the insecticide-treated apple orchard (46.6%).

Damage in two pheromone-treated pear blocks (0.8 and 1.1%) was significantly lower than in two, paired insecticide-treated pear blocks (1.9 and 2.5%). Pheromone disruption failed in only one orchard. A very poorly managed pear block with a history of codling moth damage sustained 16.8% damage compared to 8.2% damage in the insecticide-treated block.

In this study, mating disruption provided season long control of codling moth at damage levels comparable to insecticides. Given the reductions in environmental contamination, producer exposure to toxic materials and pesticide residues in fruit obtained by applying the pheromone disruption technology, pheromone-based mating disruption should be considered as a viable alternative to conventional insecticide sprays under prescribed conditions in apple and pear orchards. However, for the mating disruption technique to be adopted commercially, it must be reliable over a wide range of environmental conditions. In order to obtain this information, additional evaluation of pheromone-based mating disruption over a wider geographic range and in a larger number of orchards is planned for 1991.

SALMONELLA SURVEY OF LICENSED DAIRY HERDS

Project Number: 293

Supervision: Dr. Mervyn Wetzstein, Health Management Veterinarian, Abbotsford

Funding: D.A.T.E. 1990-91 - $7,600

Objectives: To determine the incidence and economic significance of salmonella in British Columbia dairy herds.

Summary: Food poisonings caused by salmonella are common occurrences. Salmonella can be a problem in dairy products that are not pasteurized or in the instances where the pasteurization process has failed. Agriculture is being challenged on the quality of its products. This project carried out a survey to determine salmonella levels in raw milk.

One hundred and twenty dairy producers were randomly selected from approximately 1,000 licensed producers in the province. One milk sock was collected from each of the 120 producers. These milk socks were submitted to the bacteriology lab at the ministry's Animal Health Centre in Abbotsford for analysis. Salmonella was not isolated from any of these submissions.

Unfortunately the only way to determine the absolute level of salmonella would be to sample every herd which is not economically feasible. Sampling projects in Ontario and California showed levels of approximately 8% and 15% respectively. These numbers were used to determine the number of samples for the British Columbia survey. While the survey results were negative, statistically there still could be an incidence level of 3%.

So in essence this survey shows that the quality of milk produced in British Columbia in regard to salmonella is very good and well above the other surveys done in North America.

EVALUATION OF BIOLOG MICROPLATE TECHNOLOGY FOR THE IDENTIFICATION OF PLANT PATHOGENIC BACTERIA

Leslie MacDonald and Angela Kummer examining the Biolog program which identified plant pathogenic bacteria

Project Number: 294

Supervision: Leslie MacDonald - Plant Disease Diagnostician, Cloverdale

Project Staff: Angela Kummer, Contractor

Cooperators: Dr. S. deBoer, Agriculture Canada Vancouver
Dr. R. Copeman, University of British Columbia

Branch: Crop Protection

Funding: D.A.T.E. 1990-91 - $15,000
Crop Protection - 6,000

Objectives: Bacterial diseases can spread quickly through a crop if not controlled at the onset. It is essential that the disease be identified accurately and promptly so that the best management practices can be selected.

Control measures depend on the species of bacteria involved, and may include the application of a fixed copper spray, roguing, rotation, or sometimes complete destruction of a crop. The decision to destroy a crop must be made on a reliable diagnosis. The old methods used for identification of plant pathogenic bacteria in the B.C. Ministry of Agriculture, Fisheries and Food's Plant Diagnostic Lab were slow, laborious and often inconclusive. New technology was recently developed by Biolog that enables plant pathogenic bacteria to be identified much faster and more specifically than before. To ensure the British Columbia growers have access to reliable identification of bacterial diseases of plants, the objectives were:

1) To evaluate the Biolog system for the identification of plant pathogenic bacteria.

2) To incorporate the system into the Plant Diagnostic Lab framework.

3) To enhance and customize the Biolog database by adding readings obtained from plant pathogenic bacteria isolated in British Columbia.

4) To establish a more comprehensive record of bacterial plant diseases that have occurred in British Columbia.

Summary:

1) The Biolog system gave accurate and repeatable identifications during the testing with known bacterial species. The system was demonstrated on August 30 at Cloverdale, and a summary of the project presented at the Canadian Phytopathology Society's British Columbia Regional meeting on October 24.

2) The capabilities of the lab have increased greatly as a result of the incorporation of this system into the bacterial identification protocol. Diagnosis of bacterial diseases are faster and more specific than before which means that growers can start control measures earlier, and can use the most effective disease management techniques for the particular bacterial species.

The new protocol is also more economical than the old one. Some of the equipment purchased with D.A.T.E. funds can be utilized for more effective virus testing by Enzyme Linked Immuno Sorbent Assay (ELISA).

3) The database of bacterial isolates from British Columbia is growing and plans have been made to exchange databases with the Oregon State diagnostic lab.

4) We are now in a position to establish a comprehensive record of bacterial plant diseases in British Columbia. This is essential for monitoring the disease situation and protecting British Columbia crops from the introduction of new bacterial diseases.

GINSENG REPLANT STUDY

Ginseng Plantation

Project Number: 296

Supervision: Al Oliver, Provincial Ginseng Specialist, Kamloops

Cooperators: The Associated Ginseng Growers of B.C.
B & B Ginseng, Vernon, B.C.
Pak Unlimited West, Puyallup, Washington, U.S.A.

Funding:

D.A.T.E. 1990-91	-	$1,900
B & B Ginseng	-	1,000
Pak	-	700
TAGG	-	500

Objective: To test the generally accepted rule that ginseng cannot be grown where ginseng has previously been grown as valid in British Columbia

Summary:

This study initially was to include three soil treatments and a control bed each year for three years. This first year, however, only two soil treatments, Basamid and Telone C-17 were used. They were immediately covered with plastic to make them more effective. The product Methyl Bromide was not used this year due to some technical problems. The only applicator close to B.C. is from Vancouver, Washington, and a permit was needed from Employment and Immigration for them to work here. The Washington company's equipment covers 15 feet at a time while British Columbia beds are only 6 feet wide. This treatment may be carried out in October of 1991 on two beds.

All the labor is being supplied by B & B Ginseng who owns the property that the trials are on. If the project succeeds, B & B Ginseng will own the harvested materials and all of the hardware at the end of the trial. Pak Unlimited West is supplying the shading materials for the project. This company has been very active in the development of British Columbia's ginseng industry.

During the life of this project, which could be up to 7 years, other observations in addition to the plantings themselves will be made. Weeds, insects and nematodes should all be affected by the soil treatments and advantages here will be monitored.

One of the reasons for the initiation of this project was to eliminate the need for growers to eventually have to purchase more land or lease land away from their home base. It will, though, because of the long tradition of not replanting, be hard to convince the ginseng growers to take the step to replant. This project is at least a start in an area where no studies have been done to date.

SELECTION OF CELERY CULTIVARS SUITABLE FOR THE CLOVERDALE AREA

One of the Cultivar Evaluation Plots

Project Number: 297

Supervision: W.J. Odermatt, Provincial Fresh Vegetable Industry Specialist, Cloverdale, B.C.

Project Staff: Susan Wahlgren, Cloverdale Lettuce and Vegetable Cooperative

Cooperators:
Dave J. Ormrod, Plant Pathologist
Harvie Snow, Vegetable Technician
Cloverdale Produce Farms
Maddocks Farms
Pacific Vegetable Farms
John Yue Farms

Branch: Development and Extension, South Coastal Region

Funding:
D.A.T.E. 1990-91 - $4,000
D.A.T.E. 1991-92 - 4,000

Cloverdale Lettuce and Vegetable Coop

1990-91 - $4,000
1991-92 - 4,000

Objectives:

The Cloverdale celery crop is worth close to $2 million annually at the farm gate. Losses due to diseases and disorders which are influenced by cultivar selection, commonly exceed $100,000. Cultivars also differ in many other characteristics such as yield, quality and uniformity. To reduce losses without sacrificing yields or quality, it is necessary to evaluate promising cultivars on a range of farms in order to find the most suitable ones for the area.

Summary:

The 1990 bed evaluation trials were conducted on three farms at two planting dates. The trials were planted in fields apparently free of the yellows fungus, Fusarium oxysporum f. sp. apii, and all cultivars performed well. Included were the Fusarium resistant cultivars Bishop, Starlet, Tall Utah 52-70 HK, and Tendercrisp as well as the susceptible cultivars Tall Utah 52-70 R. Imp. and Tall Utah 52-75.

The susceptible cultivars did not out-perform the resistant ones, even on apparently disease-free soil. There was no disadvantage to planting the resistant cultivars in disease-free soil.

The 1991 bed trials will be planted in fields know to be infested with the soil-borne Fusarium fungus so that evaluation can then be made under disease pressure.

Small plot screening trials evaluated cultivars at two planting dates in Fusarium infected fields in 1990. Several susceptible cultivars in the early planting were so severely affected that they were unmarketable. Others, including Tendercrisp and some experimental resistant lines, performed well under the heavy disease pressure. Two newly released cultivars from Pybas Seed, Picador and Matador, are being recommended for the 1991 bed trials.

The most cost-effective defense against celery crop losses in Fusarium yellows infested soils is the use of resistant cultivars. The knowledge gained from this project will help growers make more informed decisions in their cultivar choices with the objective of minimizing such losses.

RECOVERY AND RECIRCULATION OF DRAINAGE WATER FROM GREENHOUSE VEGETABLE CROPS

Automatic Nutrient Dosing Equipment for Recirculation

Project Number: 299

Supervision: Gordon Grant, Provincial Floriculture Specialist, Abbotsford
Jim Portree, Provincial Greenhouse Vegetable Specialist, Abbotsford
David Flood, Greenhouse Technologist, Abbotsford

Cooperators: B.C. Greenhouse Vegetable Research Council

Funding: D.A.T.E. 1990-91 - $10,590
Greenhouse Vegetable Research Council - $6,300

Objectives:

1. To assess recirculation technology and its integration into current production methods for greenhouse crops.

2. To demonstrate the feasibility of waste fertilizer recirculation and its influence on production and production costs.

3. To develop management guidelines for utilizing recirculation technology without compromising current production standards.

Summary:

Growers are increasingly concerned about ground water pollution and the possibility of stricter controls on farm effluents. New recirculating technologies can significantly reduce the amounts of fertilizers and other effluents draining from the greenhouse.

Tomato and cucumber production in sawdust bags has been a highly productive and cost effective cropping method in British Columbia, but to date, no work has been done on assessing the potential of the system to accommodate recirculation technology.

Automated fertilizer monitoring and dosing equipment including two Argus DM20 nutrient control computers were installed at the B.C. Ministry of Agriculture, Fisheries and Food test greenhouse facility in Abbotsford. A crop of sawdust grown fusarium crown rot resistant tomatoes was raised to evaluate the potential of recycling waste water for run-off control and fertilizer conservation. Tomato yields and grades were compared against an identical group of standard, drain to waste sawdust grown plants. Water and fertilizer use was monitored and regular tissue and nutrient solution analyses were performed.

Yield: No significant differences in yield or grade % occurred between treatments.

Nutrition: Some variations in solution analysis did occur during the trial, but were not substantially reflected in tissue levels.

Water Use: The recirculated crop used 28% less water than the non-recirculated crop.

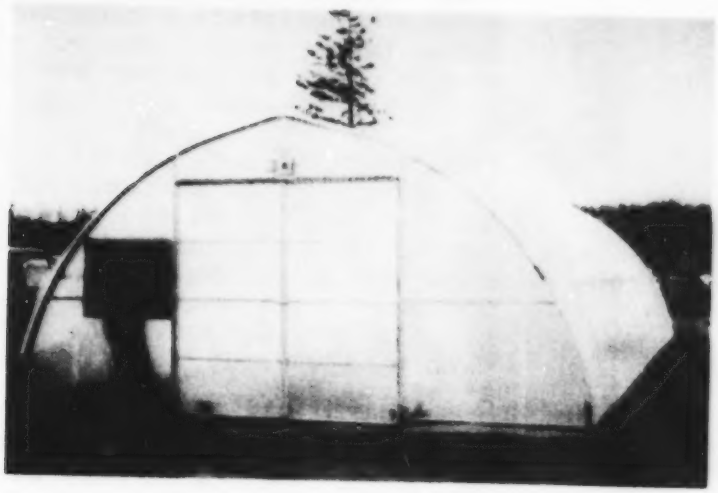
Fertilizer Use: The recirculated crop used 50% less fertilizer than the non-recirculated crop.

Pathogens: No pathogens were isolated from either crop. No plants were lost due to root or crown disease.

Work will be continuing into 1991-92 with a similar project involving the production of long English cucumbers in sawdust. The Development and Extension Branch will continue to investigate new methods of fertilizer containment and re-use in order to facilitate more cost effective and environmentally sustainable greenhouse growing practices. Efforts are now under way at several commercial operations to adopt recycling methods.

A full report of the first year's work entitled "Nutrient Recycling on Sawdust Grown Tomatoes" is available.

SANDBED SYSTEM FOR PRODUCTION OF CONTAINER ORNAMENTAL PLANTS



External View of Sandbed Trial

Project Number: 300

Supervision: Carol Barnett, Nursery Industry Specialist, Abbotsford

Cooperators: Valleybrook Gardens, Ltd.
Peter Leidenfrost, Horticulture Technician, Agriculture and Food Centre, Abbotsford

Funding: D.A.T.E. 1990-91 - $10,950

Objectives:

1) To assess the sandbed system, which features subirrigation and water recycling, under British Columbia weather conditions for the production of containerized ornamental plants.

2) To provide British Columbia growers with management information on this system that will make this a reasonable and environmentally sound alternative to the present production system.

Summary: The trial site was located at Valleybrook Gardens Ltd. in Abbotsford. A Vary cold frame 20' x 48' with roll-up sides, 6 ml poly, an inflation unit and end walls was erected. Two beds were constructed inside the poly structure.

1) Sandbed - an 8' x 39' sandbed was constructed of pressure treated lumber. A 15 gallon tank was buried in the ground to maintain a constant water table in the sand. The bed was lined with a black poly liner and filled with 4" of washed sand.

2) Ebb and Flood Bed - an 8' x 39' ebb and flood bed was constructed of pressure treated lumber. A 500 gallon tank was buried in the ground to supply enough water to raise the water over the pot bottoms in the entire bed in about a 10 to 15 minute period. The bed was lined with a black poly liner and filled with 2" of pea gravel.

A hookup to the electrical system and the irrigation system was carried out.

A third traditional nursery bed will be established and adjacent to the Vary cold frame with overhead irrigation and a gravel base. This will be used as a control bed.

Special pots with mesh bottoms to allow for capillary water uptake were purchased. Plant growth notation, pest monitoring, water sampling and other management practices will be carried out in 1991.

High-value plant types will be selected the second season. Management techniques learned in the first season will be used to produce high quality plants.

The plants will be evaluated by Carol Barnett and nurserymen at the end of the second season.

The project will be evaluated each of three years.

MARKET POSITIONING OF VEGETABLES GROWN UNDER INTEGRATED PEST MANAGEMENT (I.P.M.) TECHNIQUES

Telephone Interviewers Conducting Consumer Survey (on Integrated Pest Management Produced Vegetables)

Project Number: 301

Supervision: Jim Alcock, Horticulture Marketing Specialist
Marney James, Manager Horticulture Programs South Coastal Region

Cooperators: B.C. Coast Vegetable Cooperative
Agriculture Canada, Research Branch
E.S. Crop Consulting
Campbell Goodell Consultants

Funding: D.A.T.E. 1990-91 - $7,500

Objectives:

1) To determine attitudes and perception of purchasers of fruits and vegetables in the Lower Mainland of British Columbia with respect to production management techniques of British Columbia producers versus those in competing areas of supply.

2) To determine attitudes and perceptions about I.P.M. and other fruit and vegetable production management practices.

3) To determine attitudes and perceptions of British Columbia consumers with respect to quality of onions, carrots, and potatoes specifically and fruits and vegetables in general from British Columbia versus U.S. sources of product.

4) To determine how best to identify and position selected B.C. vegetables grown with I.P.M. technology in relation to other B.C. produce and imported fruits and vegetables.

Summary:

The terms of reference, methodology and time frame for a consumer study were submitted to three market research firms with Campbell Goodell consultants selected to undertake phase one of the project. The questionnaire was developed, tested and the survey undertaken the first week of February 1991.

The results of the survey have shown the following:

1) Three out of ten Lower Mainland produce shoppers claim to have heard of I.P.M. Of those who had, 5% thought B.C. producers used such methods all of the time and 58% thought they used them some of the time.

2) When asked if they could make any distinctions in methods of growth between B.C. produce and their competitors, most thought they were the same or were unsure and only 15% noted any differences.

3) In comparing the quality of B.C. produce to that of the U.S., half of the respondents felt that there was no difference. Some felt that the home grown was superior (a third in the case of carrots, a fifth with potatoes and 15% with onions). Less than 1% in each case felt B.C. vegetables were inferior.

4) There was a strong loyalty for B.C. produce - seven out of ten bought B.C. labeled goods at least some of the time, and of those that did, half did so in order to support local growers and associated industries. Also, when consumers adopted origin as a purchase criterion, the resulting effect was to purchase locally grown vegetables. This shows a strong base on which to build.

5) There was strong support for I.P.M. methods of growth with two-thirds opting for such produce over regular vegetables, and they say they are willing to pay extra for that preference.

The project managers are now working with B.C. Coast Vegetable Cooperative to develop specific plans for implementation of I.P.M. into a marketing program and will also be extending this to other British Columbia horticulture agencies using I.P.M. technology for incorporation into their marketing strategy.

HARDY KIWIFRUIT EVALUATION

Project Number: 302

Supervision: Brent Warner, New Crop Specialist, Sidney, B.C.
Ronny Quay, Horticulture Technician, Sidney, B.C.

Cooperators: Agriculture Canada, Plant Quarantine Station Sidney, B.C.

Branch: Development and Extension

Funding: D.A.T.E. 1990-91 - $2,000

Objective: To evaluate some of the selections of Actinidia arguta currently available for commercial cultivation.

Summary: Seventeen selections have been evaluated for fruit quality and of these, four were selected for further study. Plants of these were repropagated and a new trial will be established in 1991.

Several serious problems were identified with this crop in general, with regards to its potential for use as a commercial crop and these are as follows:

1) Difficulty in assessing fruit ripeness (i.e.) when to pick in order to achieve maximum shelf life without impacting the final fruit quality.

2) Difficulty in harvesting without damaging the fruit. Fruit pulled from the stem will, in most cases, break the skin, therefore, entire branch harvesting will be studied.

3) Unevenness of ripening - individual fruit on the same twig ripens at different times.

4) Extreme susceptibility to root rot. The entire original evaluation block was killed in 1990, by what is believed to be a Phytophthora sp. root rot fungus.

Actinidia deliciosa (kiwifruit) vines are susceptible to this fungus and to waterlogged soil conditions, but this species of Actinidia is apparently even more susceptible. This could seriously limit the areas where the crop could be established.

In conclusion, we have selected four varieties which, based on fruit size and quality, would appear to have the potential to be grown commercially, provided the problems listed above are addressed. These four selections are Ananasnaja, Issai, Noel and Red Prince.

KIWIFRUIT POLLINATION RESEARCH

Nick Pyke, MAF, New Zealand, and Rod Chilton, applying bee collected pollen to female kiwifruit flowers

Project Number:	303
Supervision:	Brent Warner, New Crop Specialist, Sidney Ronny Quay, Horticulture Technician, Sidney
Cooperators:	Agriculture Canada, Plant Quarantine Station, Sidney, B.C. Ministry of Agriculture and Fisheries (MAF), New Zealand Vantreight Farms, Saanichton
Branch:	Development and Extension
Funding:	D.A.T.E. 1990-91 - $2,000
Objective:	To continue the work on artificial pollination of kiwifruit vines.
Summary:	Mr. Nick Pyke from Ministry of Agriculture and Fisheries, New Zealand, was in Canada for six weeks in May and June of 1990 to assist in carrying out further studies on the use of bee collected pollen (BCP) for artificially pollinating kiwifruit vines.

This project has helped to finalize the data on the handling and application of this pollen. Commercial trials using BCP have proven that the process works and only minor alterations have to be made to the entire process to make it a successful procedure for commercial growers.

The use of BCP now makes it economically viable to artificially pollinate essentially all kiwifruit vineyards to insure maximum fruit size and crop potential.

SHEEP FOOTROT (SFR) SURVEY, CONTROL AND ERADICATION FIELD DEMONSTRATION

Project Number: 304

Supervision: Dr. H. Lange, Health Management Veterinarian Abbotsford
Elisabeth Jahren, Laboratory Technician

Cooperators: B.C. Sheep Grazing Association
Bert Smith, Chairman and Producer
Island Packers, Victoria
Gran Maison Packer, Cloverdale
Quist Packers, Duncan

Funding: D.A.T.E. 1990-91 - $8,445

Objective: Establish the incidence and prevalence of SFR in British Columbia and implement a control and eradication pilot project.

Summary: Sheep footrot takes a major economic toll; an estimated $12.50 per ewe is lost due to footrot. Sheep footrot is a serious contagious disease that causes severe lameness, resulting from the invasion and digestion of the hoof.

Three packing plants in the Lower Mainland and Vancouver Island helped in the collections of 2,587 sheep feet. These feet were processed at the Animal Health Centre where a fluorescent antibody test was evaluated for the detection of the SFR organism. Results indicated that 49% of the feet collected at the Lower Mainland plant were positive for SFR and those from the Victoria and Duncan plants were 11% and 17% respectively. An average of 34% of feet tested were positive during the study period from June 1990 to January 1991. A further two percent was suspicious for SFR.

In the spring of 1990, the flocks scheduled to enter Hendrix Lake clear-cut were inspected on the farms for footrot. Of the 15 flocks inspected, 13 had evidence of footrot, with a flock prevalence of 87%. The individual prevalence rates in affected flocks ranged from 9 to 82%.

A control program was implemented on the farms of infected flocks. This consisted of extensive foot trimming, foot bathing and isolation. All sheep were inspected at entry and suspect animals (84) were marked. These animals received an extra 30 minute foot bath. Despite this procedure, seven sheep developed footrot 10 days later. The affected sheep were removed from the clearcut and the remainder of the flock continued the control program.

There was no evidence of footrot in the 1,100 sheep participating in the control program after the grazing period. This program proved that SFR can be controlled and eradicated.

FIELD TESTING OF DYSTOCIA PREDICTION EQUATIONS IN FIRST CALF HEIFERS

Project Number: 305

Supervision:
Bob France, Beef Industry Specialist, Vernon, B.C.
Greg Tegart, District Agrologist, Vernon, B.C.
Graham Strachan, Senior Agrologist, Kamloops, B.C.

Cooperators:
Chutter Ranch, Merritt, B.C.
Devick Ranch, Kamloops, B.C.
Norm Peters, Kamloops, B.C.
Uli Steiner, Kamloops, B.C.
Turtle Valley Co-op, Chase, B.C.
Rob White, Kamloops, B.C.
John Schalles, Ashcroft, B.C.
Douglas Lake Ranch, Douglas Lake, B.C.
Coldstream Ranch, Vernon, B.C.
Michael Ruechel, Vernon, B.C.

Funding:
D.A.T.E. 1990-91 - $2,000
D.A.T.E. 1991-92 - $2,500

Objective:
To field test a computer model that was developed to predict calving problems (dystocia) in first calf heifers.

Summary:
It is estimated that calf losses in British Columbia due to dystocia problems account for a lost income of approximately $1.45 million annually. In addition to direct losses, dystocia can result in reduced conception rates and a delay in rebreeding. The incidence of these losses is more common in first calf heifers as compared to older cows. Reducing dystocia related problems in first calf heifers would result in an increase in net farm income due to fewer calves lost at birth and normal heifer fertility following calving.

A dystocia prediction model was developed by Dr. Laura Rutter with Alberta Agriculture. To date a total of 46 producers from both provinces have cooperated in the trial. Ten of these producers are located in British Columbia with approximately 2,000 first calf heifers being tested.

In 1990 measurements were taken on the heifers which included pelvic width and height, hip height, shoulder height, body condition score, weight, birth date and the measurement date. This data is used in the model to produce a list of those heifers that are expected to have calving problems when they calve for the first time in 1991. However, since this is a field test of the accuracy of the model to predict calving problems, the list generated by the model is not provided to the cooperators. Each producer will be asked to keep accurate calving records and to record those heifers that experience dystocia problems. If the model is successful, the records kept by the producers will closely match those generated by the model.

The outcome of this study will not be known until calving is completed next spring with a final report available during the summer. If the model can accurately predict calving problems in heifers, it could be provided to and used by veterinarians throughout the province.

Agriculture and Food Centre - Automated Weather Station

Outdoor Sensors for Automated Weather Station

Project Number: 306

Supervision: David Flood, Greenhouse Technologist

Funding: D.A.T.E. 1990-91 - $2,350

Objectives:

1) To provide Ministry Research and Extension Personnel with precise meteorological information in conjunction with field work in the Abbotsford area.

2) To provide for more accurate and efficient control of the environment at the Agriculture and Food Centre Test Greenhouse.

Summary: An Argus Weather Station was purchased and installed in April 1990. Continuous data logging of light energy, wind, rainfall, temperature and humidity was begun at that time. The accumulated data has since been used by Ministry staff in assessing growing conditions and the results of field work, in predicting the need for pest control prescriptions, and by the Provincial Emergency Preparedness Committee during the flooding conditions in the fall of 1990.

DEMONSTRATION OF AGRICULTURAL TECHNOLOGY IN THE SOUTH COASTAL REGION

Thousands tested tasty samples and learned about the diversity of Vancouver Island agriculture at Great Taste Displays in Duncan and Courtenay

Project Number: 308

Supervision: Wayne Wickens, Director, South Coastal Region

Co-operators: Bill Peters, Provincial Berry and Nut Specialist, Abbotsford, B.C.
Dr. Jack Freeman, Agassiz Research Station
Bill Weismiller, District Agriculturist, Chilliwack, B.C.
Brent Warner, New Crop Development Specialist, Sidney, B.C.
Gary Rolston, District Agriculturist, Courtenay, B.C.
Mark Turner, Rural Organizations Specialist, Duncan, B.C.
Ron Barker, Dairy Livestock Specialist, Abbotsford, B.C.
John Murray, Dairy Technologist, Duncan, B.C.
Gordon Grant, Provincial Floriculture Specialist, Abbotsford, B.C.
Dave Flood, Greenhouse Technician, Abbotsford, B.C.
Marney James, Manager, Horticulture Program, Cloverdale, B.C.
Jim Alcock, Marketing Specialist, Cloverdale, B.C.
Don Low, Pork Industry Specialist, Abbotsford, B.C.

Branch: Development and Extension, South Coastal Region

Funding: D.A.T.E. 1990-91 - $10,000

Objectives: To enhance the adoption of new technologies in the South Coastal Region by demonstrating new techniques and by observing, collecting and disseminating relevant information found outside the region.

Summary: Several promising alternatives to dinoseb were tested to assess their potential for raspberry primocane suppression (cane burning) and weed control. A range of rates and timings were used to identify the lowest effective rates. The results obtained were used to support the raspberry industry's application for "Critical Use" registration of the herbicide oxyflurofen (GOAL) for use in 1991.

A Farm Products Guide was created and published in an effort to promote farm fresh products in the Chilliwack area. In cooperation with the Chilliwack Agriscope Society, 50,000 copies of the guide were printed and distributed to local consumers, tourist centers, businesses and participating farms. The guide was successful and will be redesigned for the 1991 season. D.A.T.E. funding has facilitated this grass roots marketing project.

A "Great Taste of the Comox (Cowichan) Valley" display was set up at the Cowichan and Comox Fairs. The display featured samples of numerous local food products prepared by local chefs. Consumers learned more about local products and producers recognized the value of marketing. The display won first prize for the best educational display at the fair.

A technical update session on Udder Health was held on November 14, 1990, at a Milk Quality Seminar. Dr. Al Britten, Washington State Veterinarian/Bacteriologist and authority on mastitis control, was the guest speaker. Over one hundred people were in attendance for this very successful course co-sponsored with the Vancouver Island Dairymen's Association.

Diane Fraser of Swine Graphics Ltd., conducted a one day PIG CHAMP computer workshop for 23 producers and related industry personnel. PIG CHAMP is the most widely used on-farm swine production and health management software in North America. Many producers in the province are looking at the use of computerized record-keeping systems as a tool for monitoring production and making management decisions.

A pictorial display of Vancouver Island horticulture producers at work was undertaken. These photographs will be used in displays at various fall fairs and demonstrations put on by local farm groups and ministry staff to promote and recognize the efforts of producers engaging in a new marketing endeavour.

D.A.T.E. project number 308 also contributed $2,500 to D301 to ensure the completion of a consumers' survey on IPM-produced vegetables in an effort to maximize marketing potential. See D301 for a complete report.

Three hundred dollars was also contributed to D299 to enable the completion of the recovery and recirculation of drainage water for greenhouse vegetable crops. See D299 for a complete report.

DEMONSTRATION OF AGRICULTURAL TECHNOLOGY IN THE NORTH CENTRAL REGION

Project Number: 309

Supervision: Ken Nickel, Field Crops Agrologist, Fort St. John
Kevin Murphy, Field Crops Agrologist, Dawson Creek
Jim Tingle, Forage Industry Specialist, Prince George
Tom Pittman, Livestock Agrologist, Fort St. John
Murray Tenove, Agricultural Engineer, Dawson Creek

Cooperators: Peace River Soil Conservation Association
B.C. Grain Producers Association
Blackwater Dairy, Prince George
Summer Brothers Ranch, Farrell Creek
Martha Schuster, Summer Assistant
Karin Stever, B.C. Cattlemen's Association, Northern Forage Variety Trial Project

Funding: D.A.T.E. 1990-91 - $10,000

Objective: To undertake specific projects in the North Central region which are consistent with the terms of reference of the D.A.T.E. Program.

Summary:

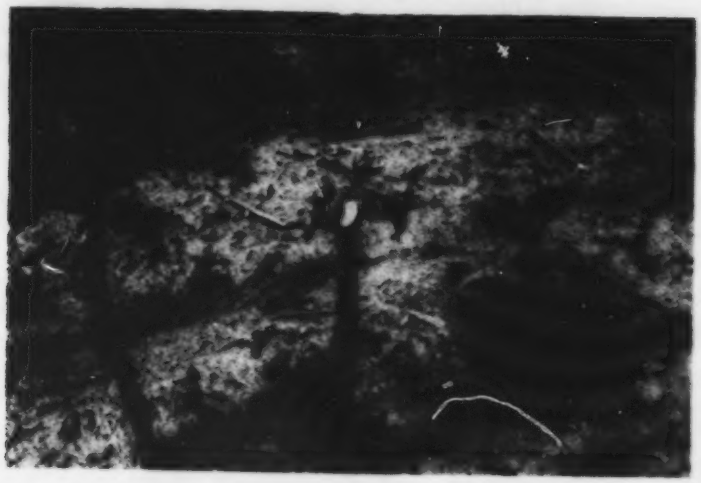
Twelve grain producers from the Peace River participated in the Air Seeding '90 Conference and Farm Progress Show in Regina, Saskatchewan. The tour was organized by Ken Nickel, Kevin Murphy and Murray Tenove. Air seeding technology is a valuable minimum-tillage option for crop producers. The Farm Progress Show featured 500 exhibits of dryland farming equipment and services.

Noxious weed control plots were established on several farms in the Flatrock-Clayhurst area in the Peace River. Ken Nickel, with the assistance of Martha Schuster, demonstrated effective weed control techniques on these plots. Seminars and field tours helped extend the methods and results. The information is helping the farmers in the area develop long-term weed control strategies.

Various forage varieties were seeded at Blackwater Dairy, Prince George. Some yield results were achieved from replicated annual ryegrass trials. Establishment of other varieties will be evaluated in the spring of 1991. Additional trials involving annual ryegrass and cereals for silage will follow in 1991.

In cooperation with Summer Brothers Ranch, Farrell Creek in the North Peace River area, large round bales were preserved using the Stirling Multibagger. Forage at 55-65% dry matter was put in the bags after being sampled. Determination of how the quality of the feed was maintained, feed palatability and the need for rodent control was assessed over the winter of 1990/91. A field day was held to demonstrate the system.

DEMONSTRATION OF AGRICULTURAL TECHNOLOGY IN THE SOUTHERN INTERIOR REGION



Dieback on Malling 9 rootstock - disturbing problem to home and commercial tree fruit nurserymen

Project Number: 310

Supervision:
Helmut Arndt, District Horticulturist Kelowna
Mike Malmberg, District Agriculturist Cranbrook
Bob France, Livestock Specialist - Beef Vernon
Graham Strachan, Senior Agrologist, Kamloops
John Vielvoye, Provincial Grape Industry Specialist, Kelowna
Al Oliver, District Horticulture Specialist Kamloops
Peter Falsetta, Agricultural Officer, Kamloops
Mike Sanders, Tree Fruit Specialist, Kelowna
Ted Moore, District Agriculturist, Kamloops
Tim Watson, District Horticulturist, Oliver
Richard Hallman, District Horticulturist Creston

Cooperators:
Okanagan Cherry Growers Association
Association of B.C. Grape Growers
BCFGA Test Orchard
Ed Nagy
D. Sterling
Provincial Bull Sale Committee.

Funding: D.A.T.E. 1990-91 - $10,000

Objective: To enhance the adaptation of new technologies in the Southern Interior Region by demonstrating new techniques and by observing, collecting and disseminating relevant information found outside the region.

Summary: The Okanagan has produced sour cherries for many years but production is now declining for a variety of reasons. Dr. Charles Kesner, a leading authority on sour cherries from the N.W. Michigan Research Station, was invited to share his expertise with Okanagan cherry growers. Dr. Kesner gave a number of presentations and visited several orchards.

Eighty growers attended the Grape and Wine Forum, a two day event designed to increase the awareness of grape growing and wine making, and to transfer knowledge in grape and wine technology to those in the industry.

Four training systems for peaches and nectarines are being evaluated under this project. First yields were obtained in 1990. The first significant yields are expected in 1991. The project will continue in 1991.

A project was initiated to ascertain the potential for commercial production of Saskatoons for fresh and processing markets in the Southern Interior of British Columbia. Thirteen cultivars were planted in two sites in 1990 and will be evaluated over a ten year period. First yields are not expected for several years.

This project assesses different treatments which reduce nursery losses in Malling 9 Rootstocks in apples. Losses in 1990 were less than 5% and therefore the effect of treatments could not be determined. The project will be continued.

The Provincial Christmas Tree Specialist attended the Northwest Christmas Tree Association short course in Portland, Oregon. This course provided a better understanding of the Christmas Tree market in the Pacific Northwest, the direction of research in the Washington State and vegetation management.

The International Beef Symposium in Montana was attended by the Beef Industry Specialist and Senior Agrologist, Kamloops. Over twenty papers were presented and information from proceedings has been used in district newsletter articles. Industry/commodity contacts also valuable.

A project to assess the economics of intensively grazing annual rye grass - hairy vetch pasture with cattle was undertaken on a vegetable farm in Pritchard. The project was designed to produce income in the "down year", as well as control weeds and increase soil organic matter. Calves on dam gained just over two pounds per day, with annual rye grass and electric fencing working well.

Oregon Seed Growers Convention attended by Creston Agrologist. Grass seed is a major crop in Creston. This conference gave current industry update in many aspects, including marketing and the issue of field burning.

A project was established to evaluate the suitability of several pasture cultivars for fallow deer. Six varieties of five perennial grass species were seeded in spring 1990 on an Armstrong farm. Evaluations of acceptance by the deer and durability of the stands will begin in 1991.

The East Kootenay Agrologist attended a Short Course on Managing Herbs and Shrubs for Multiple Use in Idaho. This gave excellent opportunity to discuss this problem so prevalent in British Columbia with experts from three Pacific Northwest states.

Dr. Larry Corah, visiting British Columbia for the Provincial Bull Sale, was retained for an extra day to speak to staff involved in the Cattle Improvement Program. He updated staff on the U.S. National Beef Cattle Improvement Program which operates now in about ten states. Staff attended from the Southern Interior Region, North Central Region, Animal Health and Crop Protection Branches.